Chemical & Engineering NEWS

The crisis in European plastics
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Instrumentation '82

Pittsburgh Conference displays wealth of new analytical instruments

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Chemical & Engineering NEWS

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News of the Week

- ***The Environmental Protection Agency*** *has aroused the ire of environmental groups in recent actions concerning disposal of hazardous wastes, lowering requirements for reporting by industry.* ***Page 8***
- ***Prospects for early recovery*** *from the recession dim as January production volume figures show a further drop and price discounting of many basic chemicals and polymers continues.* ***Page 9***
- ***Most powerful pulsed, superconducting magnet ever built,*** *according to Argonne National Laboratory, has been tested in preparation for testing cables for coils of future magnetic fusion reactors.* ***Page 9***
- ***Space shuttle*** Columbia, *scheduled to begin its third mission this week, will conduct experiments on micrometeorites, effect of weightlessness on plant growth, polarization of x-rays from solar flares.* ***Page 9***
- ***Stauffer Chemical will raze*** *its 140 million lb-per-year polyvinyl chloride plant in Long Beach, Calif., after failing to find a buyer; next to go may be its South Carolina fabrication plant.* ***Page 10***
- ***Procter & Gamble will enter the pharmaceuticals business*** *if its $371 million purchase of MortonNorwich's drug operations, including facilities in Mexico and Colombia, gets government approval.* ***Page 10***

News Focus

- ***Western European thermoplastics producers*** *are suffering heavy losses and the future offers only fiercer competition from the Middle East and Canada.* ***Page 13***

Business

- ***Naval stores*** *are as recession-hit as the rest of the industry but some products' inventories are low.* ***Page 30***

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Science

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Instrumentation '82

"User friendly" *is the catchword describing today's focus of the analytical instrumentation industry displaying its wares at the Pittsburgh Conference.* ***Page 41***

Plastics enter crisis in Western Europe

A much larger industry than already troubled European fibers, the big thermoplastics are floating in a sea of red ink and worse competition is on the way from Canada and the Middle East

Dermot A. O'Sullivan
C&EN, London

In a 400-year-old English play, a Danish prince rues the "slings and arrows of outrageous fortune" and mulls those famous alternatives for extreme action—to be or not to be. That's about the current predicament in a critically important part of the European chemical industry, the five largest-volume thermoplastics: high-density and low-density polyethylene, polypropylene, polystyrene, and polyvinyl chloride.

Like Hamlet, top management in dozens of European chemical companies are facing a terrible choice as the storm over plastics closes in. Their words aren't Shakespeare's, but the meaning is just as dramatic. Should they hang on in the hope of being able to turn the business around, even in the face of an almost certain continual financial drain? Or should they cut their losses and pull out, with all the social and political trauma that would bring?

Practically all thermoplastics producers are in deep trouble. Production costs keep rising. Yet the vast overcapacities hanging over the market are keeping a lid on prices.

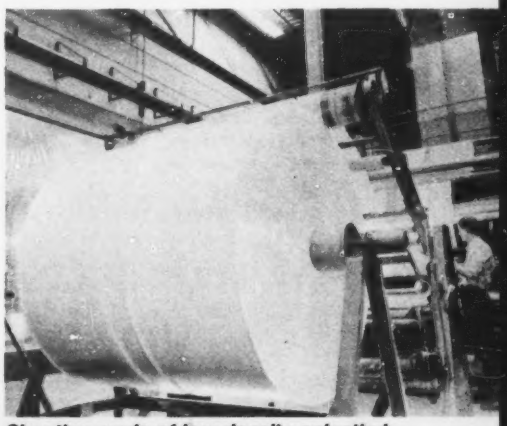
"Absolutely disastrous" is how John Harvey-Jones, chairman-elect of the U.K.'s Imperial Chemical Industries sums up the price situation during this past year.

Rolf Sammet, chairman of West Germany's Hoechst, estimated earlier this month that European producers of bulk thermoplastics chalked up a cumulative loss of some $2 billion last year. Paolo Morrione, who has taken over as head of Montepolimeri, the plastics arm of Italy's Montedison, agrees with Sammet's figure, adding that there is no way that anyone can be making money.

Following two years of falling sales and financial losses, the general contention is that the bottom has just about been reached, that demand will take an upturn, and, with it, prices. But the relief that such a change in fortune will engender could be comparatively shortlived. Supplies coming onto world markets from Canada and the Middle East in four or five years promise to spark another downward spiral for the West European producers.

It's a sad turn of events for the Europeans with their proud tradition in thermoplastic polymer technology. ICI pioneered development of low-density polyethylene (LDPE), for example. Next year is the 50th anniversary of the polymer's original discovery. The U.K. Plastics & Rubber Institute will hold a conference in London to mark the event. And the whole field of stereoregular, low-pressure polymerization of olefins—of which high-density polyethylene (HDPE) and polypropylene are the most commercially significant to date—rests on the fundamental studies of West Germany's Karl Ziegler and Italy's Giullio Natta for which they shared the 1963 Nobel Prize in Chemistry.

The present shaky market situation doesn't mean that a demise of the bulk thermoplastics in Western Europe is about to set in. Far from it. Plastics have become very much a part of daily life in Europe as elsewhere, and will continue to be so. Advantages stemming from their inherent physical properties and processability will ensure that they are here to stay. However, the heady days of double-digit annual growth that occurred in the 1950s and 1960s are gone forever, partly because the industry has become a mature one in its own right.



Sheeting made of low-density polyethylene being wound.

ICI's polyvinyl chloride plant in Wilhelmshaven is served by monomer plant in rear

Europeans try survival by shakeout

"Rationalization"—a more formal term for "shakeout"—in production and marketing of bulk thermoplastics in Western Europe offers the best hope of survival for the industry. Everyone sees need of it, everyone says it is bound to happen.

This is not mere idle musing. It is fair to assume that the overall profile of the industry will be different in five years from what it is today. Restructuring moves at individual company levels are gathering momentum.

Recently, for instance, the U.K.'s Imperial Chemical Industries unveiled plans to take over the polyvinyl chloride (PVC) operations of Switzerland's Lonza, the chemicals arm of Alusuisse. There are two plants, one in West Germany, the other in Switzerland itself, with combined annual nameplate capacity of 147 million lb split about equally between the two sites.

For ICI, the purchase will strengthen further its position as supplier of PVC to the continental European market. Last year, it brought on stream a 253 million lb-per-year plant at Wilhelmshaven, West Germany, together with an associated 660 million lb-per-year vinyl chloride facility there. The new PVC plant, with an older one in the U.K., puts ICI's total output capability at 880 million lb per year. The Lonza acquisition will move this up another 17% or so and provide ICI with special grades of the polymer that it doesn't now produce.

One of the early moves in European corporate reshuffling involving thermoplastics took place in France almost two years ago. Rhône-Poulenc relinquished sole ownership of a major part of its commercial chemicals business, including polymers. One result was establishment of a company named Chloé with three partners—Compagnie Française des Pétroles (Total) and Société Nationale Elf-Aquitaine, each with a 40.25% holding; and Rhône-Poulenc with 19.5%. Chloé takes its name from raw materials chlorine and ethylene.

Chloé has PVC plants at three French sites with combined nameplate capacity of some 880 million lb yearly. Meanwhile, Total and Elf-Aquitaine are partnered in ATO Chimie with plants making low-density polyethylene (LDPE), polypropylene, polystyrene, and PVC.

Italy is where the most intense revamping of production ownership is taking place right now. The key actors are Enoxy—the joint venture between Ente Nazionale Idrocarburi, Italy's state-owned hydrocarbons concern, and Occidental Petroleum—and Montedison's Montepolimeri. The process still is fluid. It will need government approval before the arrangements, now in detailed discussions, are completed.

Basically, it's expected that Enoxy will get the thermoplastics operations of several Italian companies—ANIC (an ENI subsidiary), Rumianca, Societa Chimica Ravenna, and Societa Industriale Resine. These, among them, have plants making all five thermoplastics, which will be transferred to Enoxy ownership. The exception will be the polypropylene activity of ANIC, to remain with that company.

Montepolimeri, meanwhile, expects to shift its LDPE operations to Enoxy. Plants at Brindisi, Ferrara, and Priolo have combined annual nameplate capacity of some 1 billion lb. Enoxy, therefore, would become sole Italian LDPE producer with nameplate capacity of more than 2 billion lb per year based on current figures. Montepolimeri would retain its PVC plants with their capacities totaling 1.1 billion lb per year.

Important as corporate mergings and reorganizations may be, more critical for Europeans is the need to reduce the very high levels of overcapacity in plants. There have been some moves in that direction, notably by BASF in Belgium and West Germany, and ATO, BP Chemicals, ICI, and Shell Chemicals in the U.K. In France, CdF Chimie has cut back on LDPE output and has converted one of its units to linear LDPE.

Overall, however, trimming of output capabilities hasn't been all that great. In fact, a number of companies have expansions planned or already under way. For example, at Antwerp, Polyolefins, jointly owned by Belgium's Petrofina and by Phillips Petroleum of the U.S., is expanding high-density polyethylene capacity (HDPE) from the present 264 million lb per year to 440 million lb. Work is expected to be completed before year's end. "We are confident in future demand and are going ahead," comments a Phillips spokesman.

Compounding the overcapacity problem, new production sites have appeared on the European scene this past year. Besides ICI's vinyl chloride and PVC operations in West Germany, Portugal's massive complex at Sines came into production. France's CdF Chimie has 28% interest in the venture, called Empresa de Polimeros de Sines. Portugal's National Petroleum Co. owns the balance. The complex has plants with annual capacity for 132 million lb of HDPE, 264 million lb of LDPE, and 110 million lb of polypropylene.

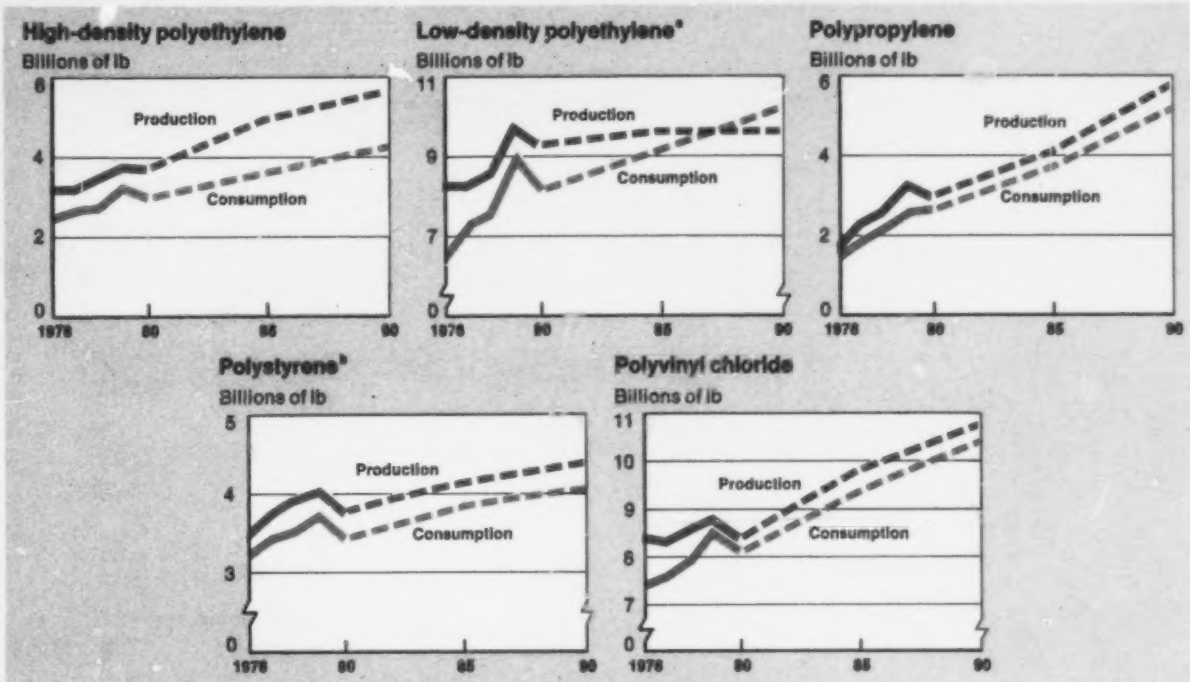
The burgeoning demand of previous years was spurred on both by substitution of such "traditional" materials as metals and glass by thermoplastics, as well as by innovation. The substitution element now has receded in importance as a promoter of growth, although it still exists. Special grades of polyvinyl chloride (PVC) are continuing to make inroads into aluminum and wood for the production of window frames, for example. Indeed, in West Germany, 40% or more of the window frames made there each year are based on PVC. Considerable potential also remains for plastics' use in automobile components, electric cable insulation, packaging, piping, and so forth.

The substitution factor, ironically, is proving to be something of a double-edged sword. Competition is occurring not only between plastics and other materials, but among the different members of the thermoplastics family. This makes forecasting future demand for individual polymers extremely difficult. Clouding the situation still more is the recent emergence of linear LDPE, which is being touted by its developers—CdF Chimie, Dow Chemical, and Union Carbide, to name but a few—as offering decided economic and performance advantages in packaging film and other uses.

Substitution and innovation, and the considerable investments these entail on the part of the converters, also have fallen victim to the general downturn in global economic activity spawned by the sharp rise in oil and energy costs since the mid-1970s. Gross domestic product has been severely depressed throughout Europe, with the European Economic Community as a whole showing negative values in 1975 and last year. Of the 10 member countries, 1981 GDP was below 1980's level for six—Belgium, West Germany, Italy, Luxembourg, the Netherlands, and the U.K. There was no change in Denmark. Only France, Greece, and Ireland registered growth, and that was marginal.

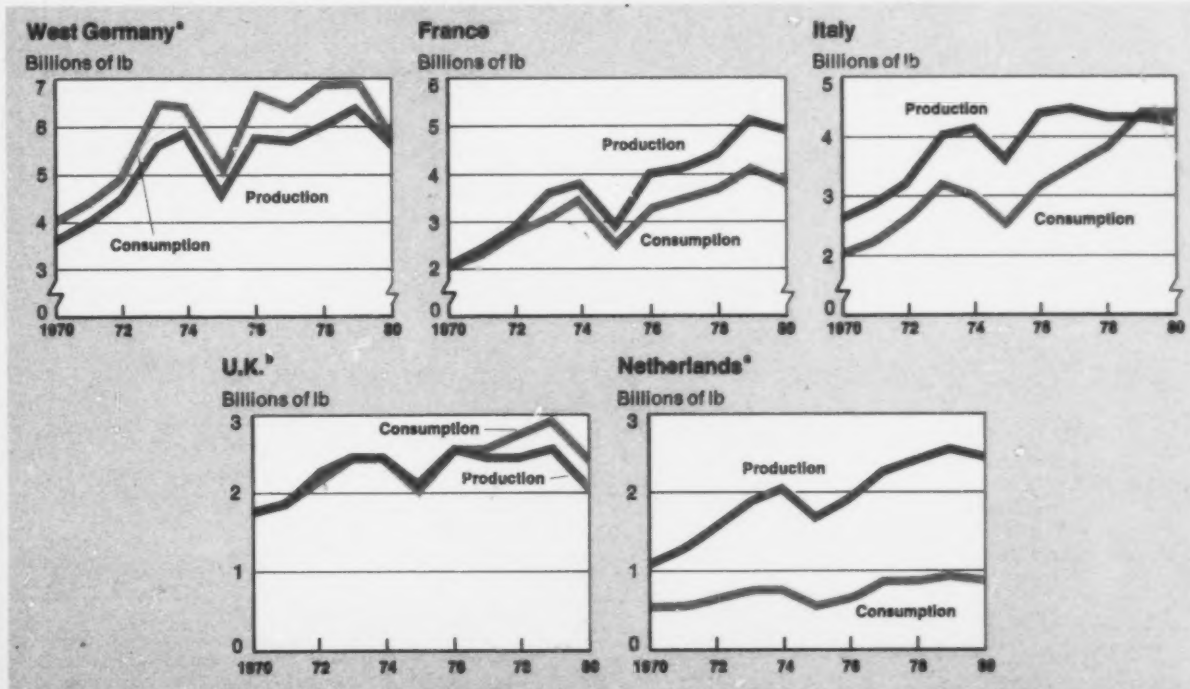
One result of low or nonexistent national growth is cuts in public spending. Large construction projects such as hospitals, schools, and roads have been stretched out, if not shelved entirely. Consequently, demand for thermoplastic products has suffered. On a broader front, in times of recession, especially when unemployment is high as it is throughout Europe, people think much more carefully before making purchases.

Fastest growing major thermoplastic in Europe is polypropylene ...



a Includes linear LDPE production beginning 1980 and linear LDPE consumption beginning 1979.
b General purpose and high impact; excludes expandable grades.
Source: Chem Systems International

...whereas fastest growing producing countries are France and the Netherlands



a Excludes high-density polyethylene. b Excludes polystyrene. Note: Data include high-density polyethylene, low-density polyethylene, polypropylene, polystyrene, and polyvinyl chloride. Sources: West German Plastics Industry Association, French Association of Plastics Producers, British Plastics Federation, and industry estimates

Thermoplastics in Western Europe are marked by high nameplate capacities, many producers

	High-density polyethylene			Low-density polyethylene		
Millions of lb	Capacity	No. of plants	Producers	Capacity	No. of plants	Producers
Austria	—	—	—	517	1	BASF
Belgium	419	2	Dow Europe; Polyolefins[d]	1,419	2	BP Chemicals; Essochem
Finland	—	—	—	363	1	Pekema
France	647	3	BP Chemicals; Soc. Industrielle de Polyoléfines[g]; Solvay	2,255	5	ATO; CdF Chimie; Cie. Chimique de la Méditerranée[h]; Copenor[i]
West Germany	2112	5	Chemische Werke Huels; Hoechst: Rheinische Olefinwerke[h]; Ruhrchemie[j]; Wacker-Chemie	2,101	3	Erdölchemie[k]; Rheinische Olefinwerke[h] Ruhrchemie[j]
Greece	—	—	—	—	—	—
Italy	825	3	Enoxy; Montepolimeri; Solvay	2,176	2	Enoxy; Montepolimeri
Netherlands	330	1	DSM	1,725	3	Dow Europe; DSM; ICI
Norway	110	1	Norpolefin[l]	242	1	Norpolefin[l]
Portugal	132	1	Empresa de Polimeros de Sines[m]	264	1	Empresa de Polimeros de Sines[m]
Spain	407	3	Calatrava; Dow Europe; Tarragona Quimica[o]	1,115	3	Alcudia; Dow Europe; Union Explosivos Rio Tinto
Sweden	266	1	Unifos[q]	363	1	Unifos[q]
U.K.	308	1	BP Chemicals	1,188	4	BP Chemicals; ICI; Monsanto; Shell
TOTAL	5606	21		13,728	27	

a General-purpose and high-impact grades, excluding expandable grades. b Chemie Linz 50%, ÖMV 50%. c Solvay 75%, Österreichische Creditanstalt 25%. d Petrofina 50%, Phillips 50%. e Montpolimeri 50%, Petrofina 50%. f Solvay 75%, ICI 25%. g Chemische Werke Huels 50%, Cie. Française de Pétroles 25%, Cie. Française de Raffinage 25%. h BASF 50%, Shell 50%. i CdF Chimie 60%, Qatar Petroleum 40%. j Hoechst 66.6%, Union Rheinische Braunkohlen Kraftstoff 33.3%. k Bayer 50%, BP Chemicals 50%. l Norsk Hydro 33.3%, Saga

This, in turn, has cut into direct and indirect sales of plastic goods.

The downturn in European plastics consumption that has occurred during the past two years reflects these influences. Sales fell in 1980, and again last year. Compared to 1979, which was a fairly strong year of growth, West European consumption of the five largest-volume thermoplastics collectively slipped 6.3% to about 25.8 billion lb in 1980, the most recent year for which data generally are available.

LDPE fared worst, its use dropping 9.2% to 8.2 billion lb, with HDPE a close second at 8.1% down to 3.3 billion lb. Then followed general-purpose and high-impact grades of polystyrene, whose consumption dropped 6.4% to 3.5 billion lb, and PVC, whose use decreased 5.5% to 8.2 billion lb. Polypropylene bucked the trend, rising 2.7% to 2.8 billion lb.

West European thermoplastics producers gained some comfort in 1980 through a strong rise in the volume of exports. According to Stephen Harriman of London-based Technon UK, who has made a detailed study of the export markets, in 1980 shipments to countries outside Europe rose 12.4% from 1979, totaling 3.56 billion lb. Polystyrene led with a 44.4% increase to 462 million lb. Then followed polypropylene, up 32% to 506 million lb; HDPE, up nearly 29% to 717 million lb; and LDPE, up 12.5% to just over 1 billion lb. PVC was the only loser, with an export drop approaching 15% to about 845 million lb.

Looking ahead, the general consensus among producers is that annual growth in European consumption will be modest, assuming, of course, that a major economic upheaval doesn't occur. Polypropylene appears to have the brightest prospect, apart from brand new linear LDPE. Chem Systems International, a consultant firm, pegs polypropylene's average annual increase at 7% between 1980 and 1990, bringing overall local demand by 1990 to 10.3 billion lb.

For HDPE, an increase of 3.5% per year to 4.4 billion lb in 1990 is forecast. PVC's annual growth might be a more modest 2.5% annually to 10.5 billion lb, and that of general-purpose and high-impact polystyrene could be as low as 1.5% to 4.1 billion lb.

LDPE is something of an anomaly with a distinctly two-tier growth pattern in store. Demand for conventional material isn't expected to show any growth in Europe in the years immediately ahead and most likely will undergo a decline on a year-to-year basis. On the other hand, strong growth is foreseen for linear LDPE. Between 1980 and 1985, growth could be as high as 59% annually, Chem Systems believes, slackening to 11% per year for the balance of the decade.

"When it comes to making an

Polypropylene			Polystyrene[k]			Polyvinyl chloride		
Capacity	No. of plants	Producers	Capacity	No. of plants	Producers	Capacity	No. of plants	Producers
216	1	Petrachemie Schwechat[b]	—	—	—	132	1	Halvic Kunstoffwerke[c]
726	3	Amoco; Hercules; Montefina[e]	680	3	BASF; Dow Europe; Montefina[e]	715	2	BASF; Solvic[f]
—	—	—	22	1	Stymer	132	1	Pekema
816	5	ATO; BP Chemicals; Hoechst; Shell; Solvay	902	3	ATO; BP Chemicals; CdF Chimie	2,244	5	ATO; Chloé; PCUK; EMC; Solvic
858	3	Chemische Werke Huels; Hoechst; Rheinische Olefinwerke[j]	1694	2	BASF; Chemische Werke Huels	2,974	7	BASF; Chemische Werke Huels; Hoechst; ICI; Lonza; Solvay; Wacker Chemie
—	—	—	70	1	Dow Europe	110	1	Essochem
880	2	ANIC; Montepolimeri	803	4	Dow Europe; Enoxy; Mazzuchelli Celluloide; Montepolimeri	2,288	3	Enoxy; Montepolimeri Solvic
462	3	DSM; ICI; Shell	524	2	Dow Europe; Hoechst	792	2	DSM; Shell
132	1	Norpolefin[l]	—	—	—	165	1	Norsk Hydro
110	1	Empresa de Polimeros de Sines[m]	—	—	—	132	1	Companhia Industrial de Resinas Sinteticas[n]
198	2	Poular; Tarragona Quimica[p]	275	3	Arrahona; BASF; Dow Europe	781	3	Aiscondel Hispavic[r]; Rio Rodano[p]
123	1	Svenska Polystyren[r]	—	—	—	220	1	KemaNobel
660	2	ICI; Shell	297	3	Dow Europe; Monsanto; Shell	1,287	4	British Industrial Plastics; BP Chemicals; ICI; Norsk Hydro
5181	**24**		**5267**	**22**		**11,972**	**32**	

Petrokjemi 33.3%, Statoil 33.3%. m Companhia Nacional de Petroquimica 72%, CdF Chimie 28%. n Portuguese interests 50%, Mitsui 25%, Shin-Etsu 25%. o Union Explosivos Rio Tinto 55%, Hoechst 45%. p Rhône-Poulenc 50%, Union Explosivos Rio Tinto 50%. q KemaNobel 50%, Union Carbide 50%. r Chemische Werke Huels 50%, Johnson Group 50%. **Note:** Capacities as of year-end 1981.

LDPE forecast, the practice is to combine conventional and linear LDPE, thereby masking the fast rise of linear LDPE that will compensate for the slow decline of conventional LDPE," explains Françoise Pardos, a polymers marketing analyst based near Paris. Moreover, she adds, "definitions are increasingly blurred among HDPE, LDPE, and linear LDPE through coblending and the capability to switch production from one product to another in the newer plants, as well as the possibility of making linear LDPE in polypropylene plants."

In some measure, European thermoplastics producers are a victim of their past successes. The seemingly limitless consumer appetite for their products less than a decade ago fostered the installation of new and expanded units, even in the wake of the first oil crisis of 1973 and the succeeding economic repercussions. According to figures compiled by the Commission of the European Communities in Brussels, EEC capacity for making polypropylene in 1980 was more than double what it was in 1975. Capacity for the other polymers also was expanded, but to a lesser extent—LDPE 28%, HDPE 27%, polystyrene 19%, and PVC 14%.

In terms of nameplate capacities, the resulting figures are startlingly high for Western Europe as a whole. Conventional LDPE leads capacity totals with nearly 14 billion lb of annual output capability. Next comes PVC with almost 12 billion lb. For HDPE, polypropylene, and polystyrene, the values are in excess of 5 billion lb per year for each.

Admittedly, nameplate capacity values should be regarded with some skepticism. Some units that companies officially count are temporarily out of service, shut indefinitely, or permanently closed down. Nevertheless, the figures do provide some measure of the considerable investment that has taken place in the industry.

Those units now functioning operate at rates well below their maximum effective capacity, which generally is about 10% less than official nameplate capacity. The EC Commission survey puts the average capacity utilization rate for the EEC thermoplastics industry in 1980 in the profit-sapping range of 62 to 68%, in contrast to 75 to 85% in 1973.

Paul A. Ray of ICI Petrochemicals & Plastics division's strategic planning group cites capacity use rates of 81% for PVC, 79% for LDPE, 74% for polypropylene, 67% for HDPE, and 63% for polystyrene in Western Europe.

"It is relevant to look not only at the percentage 'occupacities' [effective capacity use rates], which for a capital-intensive industry are very bad, but at the absolute figures of spare capacities—around 9 billion lb in total," Ray says. "In terms of cap-

Low-density polyethylene was major thermoplastic exported from Europe in 1980

Millions of lb	Export markets for Western Europe's thermoplastics									
	Low-density polyethylene		High-density polyethylene		Polyvinyl chloride		Polypropylene		Polystyrene	
Africa	317.12	30.8%	281.86	39.3%	263.58	31.2%	99.18	19.6%	32.80	7.1%
Asia	118.40	11.5	78.89	11.0	81.10	9.6	130.04	25.7	79.48	17.2
Eastern Europe	139.00	13.5	123.36	17.2	134.32	15.9	83.49	16.5	204.67	44.3
Latin America	197.68	19.2	65.98	9.2	108.13	12.8	68.31	13.5	17.56	3.8
Middle East	251.22	24.4	111.88	15.6	239.92	28.4	118.91	23.5	127.51	27.6
Oceania	6.18	0.6	2.15	0.3	6.76	0.8	—	—	—	—
U.S. & Canada	—	—	53.07	7.4	10.98	1.3	6.07	1.2	—	—
TOTAL	1029.60	100.0%	717.19	100.0%	844.79	100.0%	506.00	100.0%	462.00	100.0%

Source: Tecnon (U.K.) Ltd.

U.S. plastics exports to Europe fell in 1981

Millions of lb	1981[a]	1980	1979	1978	% change 1980–81
Polyethylene, low and medium density					
To Western Europe	99.059	171.532	71.269	44.985	−42.25%
Total U.S. exports	966.437	1187.269	916.224	682.699	−18.60
Western Europe as % of total	10.25%	14.45%	7.78%	6.59%	
Polyethylene, high density					
To Western Europe	47.846	76.504	64.043	52.974	−37.46
Total U.S. exports	617.749	711.180	725.265	477.688	−13.14
Western Europe as % of total	7.75%	10.76%	11.59%	11.09%	
Polypropylene					
To Western Europe	32.078	72.189	39.646	16.394	−55.56
Total U.S. exports	633.758	849.880	802.123	326.569	−25.34
Western Europe as % of total	5.06%	8.50%	4.94%	5.02%	
Polystyrene					
To Western Europe	3.983	12.388	12.004	7.310	−67.80
Total U.S. exports	200.167	226.636	199.991	149.552	−11.68
Western Europe as % of total	1.99%	5.46%	6.00%	4.89%	
Polyvinyl chloride (compounded and uncompounded)					
To Western Europe	62.868	65.617	33.510	35.23[illegible]	−4.19
Total U.S. exports	470.162	481.812	372.069	271.204	−2.42
Western Europe as % of total	13.37%	13.62%	9.01%	12.99%	

a Estimate for 1981 based on first 10 months' figures. Source: U.S. Department of Commerce

ital at current prices, around $3 billion of assets were not earning a dime in 1980." The situation probably worsened last year.

Not surprisingly, top managements of practically all companies in the business are subjecting their operations to intense scrutiny. This already has led to some streamlining of their operations, including plant shutdowns. More will follow.

It's tempting to liken the current depressed state of West European thermoplastics to the more notorious poor performance of synthetic fibers there in the past few years. True, there are some similarities, but it is too simplistic an analogy. Fundamental differences would make a correction of the polymers problem much more difficult to achieve.

For one, there are many more companies (and more diverse ones at that) engaged in thermoplastics production than there are in fibers. In contrast to the dozen or so majors making synthetic fibers when troubles in that industry set in five or six years back, there are about twice that number in each of the bulk thermoplastics. Thermoplastics are simply a much bigger business with much more at stake for the industry.

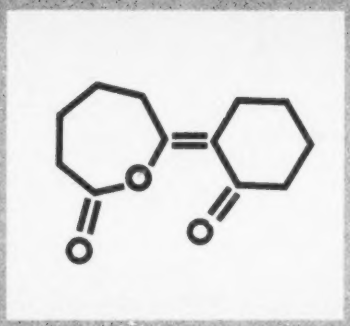
Linear low-density polyethylene and polypropylene hold promise of growth

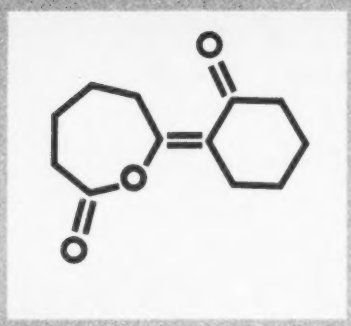
	% annual change			
	1976–80	1980–85	1985–90	1980–90
High-density polyethylene				
Production	4.0%	5.7%	2.4%	4.0%
Consumption	4.8	3.6	3.3	3.5
Net exports	1.2	−11.0	−0.6	−5.9
Low-density polyethylene[a]				
Production	2.6	−1.7	−0.2	−0.9
Consumption	5.4	−0.5	0.3	−0.1
Net exports	−8.5	−6.5	−9.7	−8.1
Linear low-density polyethylene				
Production	0.0	82.0	7.0	39.5
Consumption	0.0	58.5	10.8	32.5
Net exports	0.0	0.0	0.0	0.0

	% annual change			
	1976–80	1980–85	1985–90	1980–90
Polypropylene				
Production	15.3	6.0	7.2	6.6
Consumption	14.0	6.8	7.3	7.0
Net exports	40.6	−6.9	5.9	−0.7
Polystyrene				
Production	1.8	2.0	0.9	1.5
Consumption	1.7	2.0	1.0	1.5
Net exports	2.4	3.4	0.0	1.7
Polyvinyl chloride				
Production	0.1	3.1	1.9	2.5
Consumption	2.3	2.9	2.0	2.5
Net exports	−21.6	2.2	−1.6	0.3

a Excluding linear low-density polyethylene. Source: Chem Systems International

Z or E lactone?





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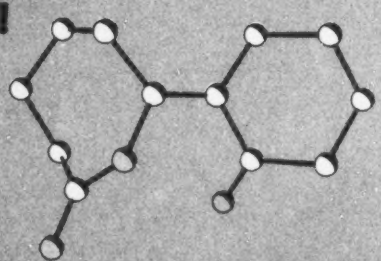

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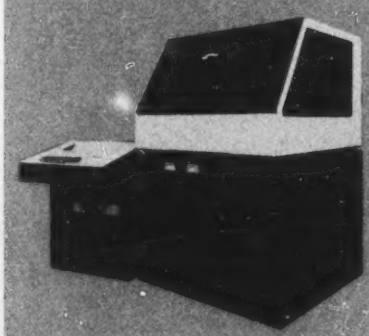

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*Jennings et al. *Journal of Organic Chemistry*, 1981, *46*, 2599

CIRCLE 42 ON READER SERVICE CARD

For each of HDPE, LDPE, polypropylene, and polystyrene, there are more than 20 producers. For PVC, there are more than 30. In the U.S., by comparison, 13 companies or fewer make each of the polyolefins, 17 make polystyrene, and 20 make PVC. Consequently, it would be much more difficult to arrive at some form of consensus in Europe on cutbacks and output sharing among the participants, even if such were allowable under the rules of EEC, which it isn't.

Of course, as U.S. companies have found in a crowded field such as polyester filament fiber, there is no necessary safety in numbers, but quite the opposite in a poor market. Weak producers with small or inefficient plants can be forced out rudely. In Europe, more socialistic governments damp this tendency but don't eliminate it.

Apart from sheer numbers, European ownership of thermoplastics plants is more diverse. Chemical companies, oil companies, state concerns, even banks are involved. ICI's Ray, who has compiled a profile of plant participants, figures that in the case of HDPE, chemical companies comprise 59% of the ownership, international oil companies 16%, state oil companies 15%, and other state enterprises 10%. For the five polymers as a whole, Ray's breakdown is chemical companies 53%, international oil companies 15%, state oil companies 20%, and other state industries 12%.

Yet another complicating factor is that partnerships abound. In several instances, companies have a stake in outside manufacturing enterprises making a given product as well as production facilities of their own. Also, in some partnerships only one of the partners actually markets the product. Such is the case, for example, for West Germany's Rheinische Olefinwerke. Though jointly owned by BASF and Shell, BASF has control of sales. Ray concludes, "Extra dimensions of strategy objectives are present in the industry, which contribute to the problems, and provide additional complexity to their resolution."

Despite such tangled managements, the current woeful business conditions bring up an obvious question. If companies continue to lose money on their thermoplastics operations, why don't they drop out of the business entirely? Such a solution isn't that easy for more than partnership reasons. A swing away from the polyethylenes, for example,

C&EN staff photo

Milk is delivered in HDPE crates in U.K. (above). Worker fashions PVC jackboot

would create its own set of problems for producers of ethylene, who already are contending with low plant utilization rates. Or, a cutback in ethylene production would lessen the amount of available coproduct propylene, and tend to push up its price. Since many makers of polyolefins draw on their own captive feedstock source, a shift in product portfolio would cause alternate upheavals.

Nevertheless, some company managers have bitten the bullet and have lessened their involvement in thermoplastics. U.S.-controlled managements stand out because of their relatively greater freedom to make such drastic moves. For example, Monsanto and Union Carbide sold off large chunks of their businesses to BP Chemicals four years ago. In hindsight, the decisions were adroit ones, although they elicited some consternation at the time.

Monsanto kept its 99 million lb-per-year LDPE plant at Fawley, England (ethylene is supplied over the fence from neighboring Esso Chemical), and a 55 million lb-per-year polystyrene operation at Newport, Wales. Considering the present situation, it would seem that both are prime candidates for eventual closure. Carbide, meanwhile, has a stake in European HDPE and LDPE through its joint venture with KemaNobel in Sweden's Unifos. Now going in at the Stenungsund site is a unit, one of Europe's largest, for making 330 million lb annually of linear LDPE, based on Carbide's Unipol process.

In addition to Monsanto and Union Carbide, six other U.S. companies have a position in West European thermoplastics. They are Amoco, part of Standard Oil (Ind.); Dow Chemical; Exxon's Essochem; Hercules; Occidental Petroleum, through its 50% holding in Enoxy; and Phillips Petroleum.

European producers have begun to nibble at plant closures. BASF last year permanently shut down its 88 million lb-per-year LDPE operation at Antwerp, Belgium. The product was used mainly for making fertilizer sacks. And Rheinische Olefinwerke at Wesseling, West Germany, BASF's joint venture with Deutsche Shell, has stripped 352 million lb from its 1.5 billion lb annual capacity there. These moves have cut BASF's LDPE capacity in Western Europe about one fifth. ATO and CdF Chimie in France, ICI and Shell Chemicals in the U.K., and companies elsewhere have taken actions along similar lines, or are on the verge of doing so.

BP Chemicals has a lot of unused capacity on its hands, much of it stemming from the Monsanto and Union Carbide purchases. Managing director Robert Horton now has the difficult task of trying to sort it all out and take measures to stem the financial strain on the company that its plastics involvement is proving to be. Several units have been closed. Peter Walters, British Petroleum's new chariman, has gone on record saying, "All areas and businesses of BP Chemicals are being examined. In the light of this, further plant closures can't be ruled out."

In the final weeks of last year, Montepolimeri temporarily stopped producing and selling LDPE. The decision was aimed at making "a responsible contribution to the stabilization of the market, which for many months has been characterized by a foolish waste of resources by the entire plastics manufacturing industry," commented Paolo Morrione.

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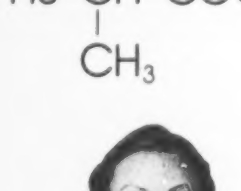

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Noting that the cost of ethylene underwent "an increase of 30% since the beginning of 1980," Morrione points out that when the decision was made, LDPE was being sold in Western Europe at 20% below the breakeven cost: "the result of the aggressive policy of some manufacturers who, by destabilizing the market, have substantially damaged the entire industrial sector."

No one argues that prices are weak, least of all the producers. A gap of about 10% on average exists between the going market price for bulk thermoplastics in Europe and manufacturers' quoted prices. BP Chemicals' Bob Horton says that a further $300 or so per ton (roughly a 20% increase) is needed on the price of thermoplastics in general. About $200 of that is required to cover higher production costs and $100 to provide some profit. He figures that companies are losing about $200 on every ton of product they sell.

Dow Europe, for one, raised its polystyrene sales price 12 to 15% at the beginning of the month. Whether this price will stick remains to be seen. The company's past attempts to improve prices and profitability weren't entirely successful.

Europeans have leveled some criticism at the U.S. over the quantities of thermoplastics shipped to Europe at what they claim have been low prices. Last year, however, shipments from the U.S. dropped noticeably.

Since then, a concern about imports has swung toward Eastern Europe, particularly with respect to LDPE and PVC. The EC Commission is acting on a complaint lodged by the European Council of Chemical Manufacturers' Federations (CEFIC) in which it claims PVC is arriving in EEC at dumped prices from Czechoslovakia, East Germany, Hungary, and Romania. CEFIC is preparing a similar case for LDPE.

According to CEFIC's data, the amount of PVC resins and compounds entering EEC from these four countries increased 47% in 1980 from 1979 to almost 262 million lb. "This increased the four countries' share of the available EEC market from 3.2 to 5%," CEFIC points out. Penetration increased further to 6.5% of 1981's market.

No less important, the price of the imports allegedly undercut EEC producers' prices up to 26%, leading to a decline in West European prices over the past two and a half years. CEFIC says that, "due to price depression caused by these dumped imports, EEC producers have failed

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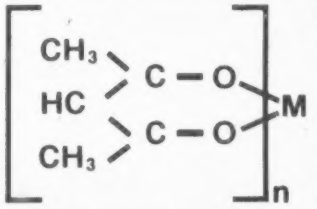

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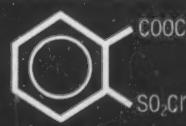
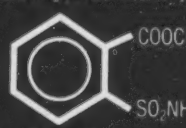
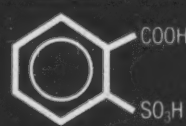


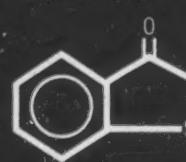
CBC
(o-Carbomethoxybenzenesulfonyl Chloride)



OCBS
(o-Carbomethoxybenzenesulfonamide)



SBA
(o-Sulfobenzoic Acid)



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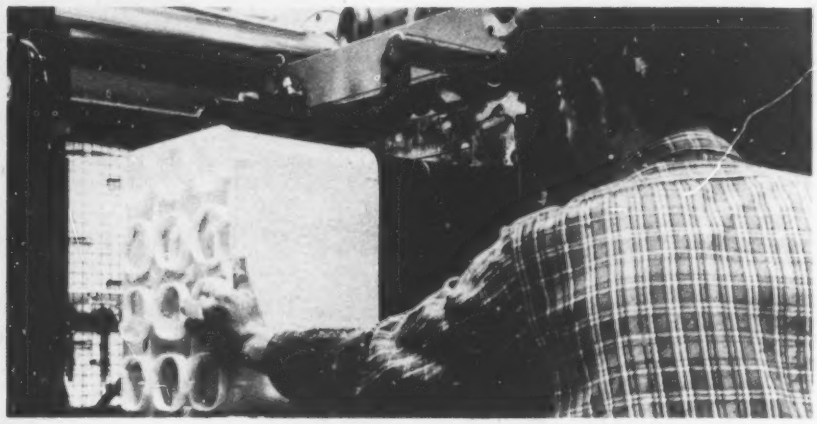
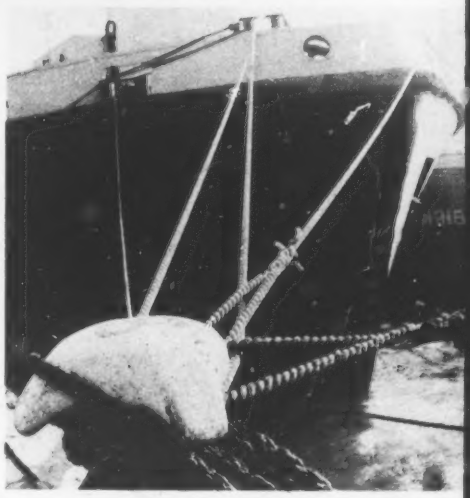




Heineken beer crates are made of HDPE (above). Ship is secured by cables fashioned from polypropylene

to cover rising costs and have encountered substantial financial losses. Moreover, several EEC producers were forced to cut production and reduce their work force."

Europeans admit to some nervousness at the prospect of competition from new producing countries. Saudi Arabia looms largest in their concern because of its geographic proximity. Within less than five years, plants now being built there will have a combined annual nameplate capacity exceeding 1.89 billion lb of polyethylene. Dow, Exxon, Mobil, and a group of Japanese companies are involved in the new plants.

The project in which Dow is participating will have an annual polyethylene capacity of 396 million lb. A likely split will be 231 million lb of HDPE and 165 million lb of linear LDPE. Exxon's capacity will be 572 million lb of linear LDPE. The Japanese consortium will have a capacity of 286 million lb of conventional LDPE. These three projects are located at Al Jubail on the Persian Gulf. At Yanbu, on Saudi Arabia's west coast, Mobil has a 50% interest in plants designed to make up to 200 million lb of HDPE and 440 million lb of LDPE yearly. The bulk of all production will be exported.

Although construction costs will be higher than the norm for such units elsewhere, Saudi Arabia is in the enviable position of having plentiful supplies of indigenous natural gas. So it is reasonable to assume that output cost per pound of the polymers will be less than for Europe.

Competition, therefore, promises to be intense, at least on a price basis. West Europeans undoubtedly will find it difficult, too, to hold onto many of their export outlets, especially those in Africa and the Middle East itself. However, executives at Saudi Basic Industries Inc. (SABIC), which owns 50% of all petrochemical projects in the country, insist that they intend to enter world markets "in an orderly manner." For producers in EEC, there is an added dimension to the Saudi problem. All Arab countries, Saudi Arabia included, are beneficiaries of EEC's Generalized System of Preferences. This means that they can sell products in EEC duty free. The preference system presupposes, of course, that the countries behave in an economically responsible way. But it raises the interesting possibility that Dow, Exxon, and Mobil will gain from the no-tariff advantage on any sales of their Saudi plastics in EEC, at least to the extent of 50% of the income, their individual percentage stakes in the ventures.

Could this be yet another cruel twist of the "outrageous fortune" European thermoplastics producers see inflicted on them, much from the outside and some of that from the U.S.? □

Naval stores markets on hold during recession

Pricing is soft as major markets suffer through recession; recovery may be quick in some areas where inventory stocks are low

Nobody in the naval stores industry is arguing that things are great—the business certainly is suffering. Actually, things could be worse, for an ironic reason: The industry's source of raw materials, the pulp and paper industry, is hurting even more. Because of that, pulpers have cut back their production, and consequently that of the by-products that constitute the raw materials for naval stores. So naval-stores producers have that much less to worry about.

Given that, naval-stores producers and marketers are saying that business is no worse than everybody else's, and that they simply have to wait out an upturn in the economy. When that comes along, however, its impact won't be felt immediately across the board for naval stores, because of a mixed inventory picture.

Turpentine producers, for example, say there is little inventory in stock among their customers, so any pickup in demand should be felt immediately. Similarly, tall-oil fatty acid stocks on hand at the end of 1981 were down nearly 26% from those on hand at the end of 1980, according to the Pulp Chemicals Association. However, year-end inventories of crude tall oil were up nearly 19% in 1981 over 1980, and those of tall-oil rosin were up 118%. And wood rosins, another major category of naval stores, were seeing inventory build-ups, some sources indicate.

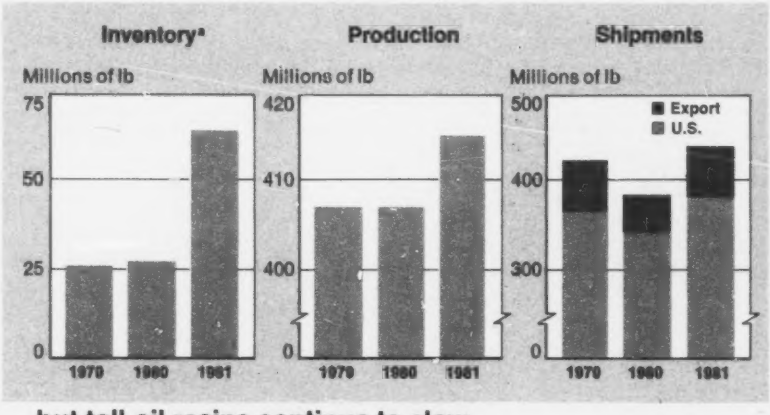
The downturn, perhaps, has been most surprising for makers of tall oil and its derivatives. Tall oil—derived from the Swedish word for pine, to distinguish the products from the pine oil that people in the U.S. associate with pine-oil disinfectants—as a feedstock has become by far the primary source of naval stores, because its production source, sulfate pulp production, has become by far the major source of pulp. Sulfate capacity now represents more than 75% of total U.S. pulp capacity, and that proportion is expected to hold if not increase over the years.

The market for tall-oil fatty acids alone in 1979 was $160 million. By 1989, that is expected to be $430 million, for consumption of some 617 million lb, according to a recent study by consultant Edward G. Hochberg, of Chester, N.J.-based Hochberg & Co. That consumption will go into a variety of areas, such as mining specialties (for example, flotation reagents), corrosion inhibitors, printing inks and coatings, rubber emulsifiers, surfactants, adhesives, and plasticizers.

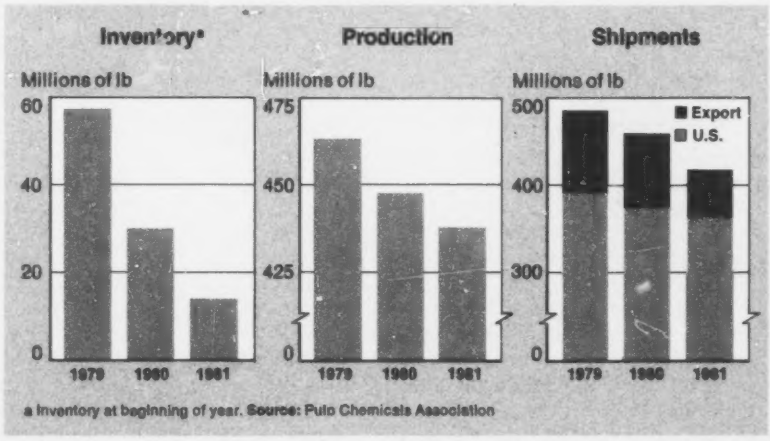
The market for tall-oil rosins—489 million lb, worth about $145 million in 1979—is expected to hit 624 million lb, with a value of $299 million, in 1989, predicts Hochberg. Most of the markets are similar to those for tall-oil fatty acids—printing inks, adhesives, rubber emulsifiers, and coatings, for example—with one other market, paper sizings.

Tall-oil rosins face general competition from wood rosins obtained by steam distillation of aged tree stumps. But a shortage of naturally aged (20 or 30 years) pine stumps has caused the technique to fall on hard times. Hercules and the other remaining producer, Reichhold Chemicals, have high hopes for a process using Paraquat that Hercules is trying out: Young pine stumps are injected with Paraquat to stimulate formation of

Tall-oil fatty acids improved after a poor 1980...



...but tall-oil rosins continue to slow



a Inventory at beginning of year. Source: Pulp Chemicals Association

rosin. If successful, the process could boost substantially wood rosin production.

If the tall-oil business really saw a slump develop only late in 1981, turpentine was in different straits. For that material, business was slow the year through. There were several reasons for the slump, but one of the major ones was a softening of one of the primary markets for turpentine derivatives, in chemicals for synthetic flavors and fragrances. Alpha-pinene, one of the two major derivatives of turpentine, is used for pine oil for disinfectants—not particularly a wildly growing product category. So fractionators have emphasized beta-pinene, which goes into higher-growth areas such as adhesives tackifiers and flavors and fragrances.

That market for beta-pinene, in turn, has shifted over the recent past, as marketers have concentrated on flavors and fragrance chemicals, with higher profit margins than tackifiers. They didn't abandon the tackifier market but they didn't wage a fierce battle against the hydrocarbon resins that came in at lower prices.

Now, however, the flavor and fragrance chemical market is softening. As one marketer points out, the U.S. and Europe account for 75 to 80 % of the world's demand for flavors and fragrances. With the economies in those two regions down, some of the primary markets for synthetic flavors and fragrances, in particular—for example, air fresheners and toilet-bowl disinfectants—are discretionary purchases, and those markets have suffered somewhat. Disappointed producers put more resin back into the tackifiers business, and that hurt prices there, too.

To some extent, that can be handy, because it makes the turpentine-derived materials more competitive with petrochemical-derived products. But more important, the softening markets have backed up into turpentine to such an extent that, according to one source, some producers are burning turpentine as fuel. (Its real value to the fractionator and upgrader is less than its fuel value.) Another marketer frets over that development, terming turpentine inherently too valuable a raw material. Nonetheless, prices are off. Southeastern mill prices currently are ranging from 65 to 90 cents per gal—down from about $1.50—with differences depending upon quality and distance hauled. Canadian and far-western prices are even lower, because of lower-quality product.

Patricia Layman, New York

CHECKOFF

MERGERS

■ **Air Products**—Acquires business of Empire Welding Supply Co., Denver-based cylinder gas distributor and welding equipment supplier, for undisclosed terms.

■ **Armak Co.**—Subsidiary of Akzona sells pressure-sensitive tape division to Bemis Co., Minneapolis; agreement covers Armak's Marysville, Mich., plant and warehouse and business assets of operation.

Sells fatty acid esters business, consisting of plant in Philadelphia and 50 employees, to Stepan Chemical; business sells basic ingredients to major producers and marketers of personal care and cosmetic products.

■ **Ferro Corp.**—Sells its U.S. engineering activities to Eisenmann Machinery Corp. of Troy, Mich., for undisclosed terms. Transfer involves all assets, including manufacturing facilities of Temtek-Allied division of Crystal Lake, Ill., and certain other assets as well as license agreement of Ferro's U.S. and Canadian porcelain enamel engineering units. Eisenmann is affiliate of Eisenmann K.G. Maschinenbau GmbH, Boblingen, West Germany.

■ **Hooker Chemical**—Sells its specialty polymers business located in Hicksville, N.Y., to Ruco Polymer Corp., a newly formed company, for undisclosed terms. Manufacture will focus on high-technology polyester polyol and urethane product lines that recently have been the unit's primary activity. Company expects 1982 sales of $30 million.

■ **Linden Chemicals & Plastics**—Acquires Tridyn Industries, Greensboro, N.C., polyvinyl chloride pipe and fittings manufacturer, through Linden's LCP Plastics-North Carolina subsidiary. Acquisition includes 80,000-sq-ft facility with about 40 million lb of annual capacity.

■ **NL Industries**—Sells castor oil and urethane product lines and Bayonne, N.J., manufacturing facility to CasChem, privately owned company formed to purchase the businesses. Products from facility go to telecommunications, biomedical, cosmetics, and coatings industries; anticipated sales in 1982 are about $50 million.

Sells two 900 ton-per-day sulfuric acid plants at Sayreville, N.J., to C-I-L Chemicals of Detroit, the U.S. arm of Canadian Industries Ltd. Purchase agreement also calls for C-I-L to supply NL sulfuric acid for its titanium pigment facility in Sayreville.

■ **PPG Industries**—Purchases substantially all assets, properties, and business of Hughes Chemical Co., manufacturer of adhesives and sealants based in Madison Heights, Mich., which has manufacturing and laboratory facilities in Michigan and California and had 1981 sales of about $15 million. Most of its products go to the auto industry.

■ **G. D. Searle**—Sells assets of Akwell Industries to Dunlop Olympic Ltd., Melbourne, Australia, for undisclosed purchase price. Akwell, which makes latex products, becomes part of Ansell International, latex consumer and medical products division of Dunlop Olympic.

■ **SmithKline**—Completes acquisition of Beckman Instruments and makes Beckman wholly owned subsidiary of new company called SmithKline Beckman. In new company, Beckman will retain its identity and continue to operate under present management. Beckman sales in 1981 fiscal year were $618 million.

■ **Allied Corp.**—Sells its Converse athletic footwear division to group of investors for about $100 million in cash. Investor group is headed by Richard B. Loynd, chairman of Converse, and John P. O'Neil, president and chief executive officer. Allied got Converse when it acquired Eltra Corp. in 1979.

■ **Du Pont**—Sells its domestic Vexar thermoplastic netting business to Amoco Fabrics Co. of Atlanta for undisclosed price. Vexar thermoplastic netting is based on polyethylene and polypropylene resins.